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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/913,368	12/17/2001	Peter Kenington	46309/262012	9610

22186 7590 04/04/2007
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EXAMINER	
WONG, LINDA	
ART UNIT	PAPER NUMBER
2611	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/04/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	09/913,368	KENINGTON, PETER	
	Examiner	Art Unit	
	Linda Wong	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 November 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *33,36,37,39-57 and 61-74* is/are pending in the application.

4a) Of the above claim(s) *34-35,38,58-60* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *33,36,37,39-41,43-47,49-57,61-66,68 and 70-74* is/are rejected.

7)☒ Claim(s) *48,50,67 and 69* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see Applicant's Arguments, filed 11/13/2006, with respect to the rejection(s) of claim(s) 33-34,44,57-58,62 under 35 USC 102 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Shalom et al (US Patent No.: 6166601) in view of Narahashi et al (US Patent No.: 5166634).

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. **Claim 70** is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

   a. **Claim 70** recites the limitation "the step of introducing, between the steps of amplification and frequency conversion". The examiner is uncertain as to what is being introduced between the steps of amplification and frequency conversion.

   Note: For the prior art rejection as stated below, the examiner will consider the linearizer or the step of introducing linearization procedure as the step being

introduced between the amplification and frequency conversion based on the limitations as recited in claim 33.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. **Claims 33,39-45,54,57,61-62,65,70-74** are rejected under 35 U.S.C. 103(a) as being unpatentable over Shalom et al (US Patent No.: 6166601) in view of Narahashi et al (US Patent No.: 5166634).

   a. **Claims 33,57**,

      i. Shalom et al discloses

         - "a signal amplifier and a frequency converter which operate in succession on an input signal" (Fig. 4, label 108 as the amplifier, labels 128,132 as frequency converters)
         - "a lineariser which is provided between the amplifier and the frequency converter to introduce a correction signal that is adapted to make the overall input and output characteristic of the apparatus more linear by linearising both the amplifier and frequency converter" (Fig. 3, Fig. 4, label 124, Abstract, Col. 2, 7-14, Col. 7, 27-30,66-67, Col. 8, 1-9,32-35,41-44)

- "a feedback signal, derived from the output of the apparatus and containing distortion components from the pilot signal produced by at least one of the frequency converter and the amplifier, is used by the lineariser to adapt the correction signal" (Fig. 3, Col. 2,10-14)

ii. Shalom et al fails to disclose

A. "a pilot signal generator adapted to introduce a pilot signal into the input signal prior to" the predistortion unit (Fig. 4, labels 21,20 as the pilot generator and pilot insertion component, respectively and labels 1,2,30,33,29,31 as the predistortion unit)

B. "the pilot signal is removed from the output of the apparatus by a filter or by the introduction of a pilot cancellation signal".

iii. Narahashi et al discloses

- Regarding limitation A, a pilot signal generator is shown in Fig. 9, labels 20,40,21 and Fig. 4, label 20,21 introduced prior to the predistortion unit or unit for adjusting the non-linearity errors, labels 1,2.
- Regarding limitation B, a bandpass filter, Fig. 4, label 32, for eliminating the pilot signal inserted by label 21. (Col. 5, lines 41-51)
- It would have been obvious to one skilled in the art to combine the pilot signal generator as disclosed by Narahashi et al prior to the predistortion unit or RF processing block or non-linearity canceling block (Fig. 4, label 120) comprising frequency conversion as well as amplification (Fig. 4, labels 128,132,108) as well as eliminate the pilot

signal by use of a filter as disclosed by Narahashi et al so to peculate "the possibility of the pilot signal component appearing in its output and hence permits the adjustment for equilibrium even during the signal amplifying operation and retains the equilibrium state for a long period of time" (Col. 3, 16-25) and maintain balance of the predistortion circuit. (Col. 7, lines 19-42)

b. **Claim 39**, claim 39 inherits all the limitations of claim 33. Shalom et al in view of Narahashi et al discloses "the pilot cancellation signal is adjusted using feedback derived from the output of the apparatus." (Narahashi et al, Abstract discloses "the pilot signal is canceled by supplying the error injection path or signal output path with the first pilot signal after adjusting its amplitude", Fig. 4, label 33 shows the adjustment of the error injection path, label 6, Fig. 6, labels 20,37, Col. 8, lines 18-24) It would have been obvious to one skilled in the art to incorporate the claimed limitation as disclosed by Narahashi et al into Shalom et al's invention so to linearize or eliminate as much non-linearity of the input to the power amplifier so proper amplification can occur.

c. **Claim 40**, claim 40 inherits all the limitations of claim 33. Narahashi et al discloses "the pilot cancellation signal comprises a frequency converted, phase shifted and amplitude adjusted version of the pilot signal". (Fig. 6, labels 20,34,35,36 shows the pilot signal is amplitude and phase adjusted (Col. 7, lines 53-56), wherein the pilot signal cancellation signal is the input to label 37, Fig. 18A, label 58 shows the pilot signal can be modulated with Lo1 producing a

signal at the frequency set by Lo1 (Col. 14, lines 55-57)) It would have been obvious to one skilled in the art to incorporate the claimed limitation as disclosed by Narahashi et al into Shalom et al's invention so to linearize or eliminate as much non-linearity of the input to the power amplifier so proper amplification can occur.

d. **Claims 41,61**, claim 41 inherits all the limitations of claim 33 or 57, respectively. Narahashi et al discloses a controller comprising a microprocessor to "control the pilot cancellation signal using feedback from the output of the signal processing apparatus". (Fig. 6, label 33, Col. 5, lines 33-34 discloses the controller comprises a microprocessor, wherein a digital signal processor is a type of microprocessor.) It would have been obvious to one skilled in the art to incorporate the claimed limitation as disclosed by Narahashi et al into Shalom et al's invention so to linearize or eliminate as much non-linearity of the input to the power amplifier so proper amplification can occur.

e. **Claim 42**, claim 42 inherits all the limitations of claim 33. Narahashi et al discloses "a suppressor for canceling signals which are images of the pilot signal." (Fig. 4, labels 31,29, Col. 14, lines 44-67 discloses the levels of the pilot signals are detected and suppressed. By detecting the levels of the pilot signals, images or multiple levels of the pilot signals will be detected and suppressed.) It would have been obvious to one skilled in the art to incorporate the claimed limitation as disclosed by Narahashi et al into Shalom et al's

invention so to linearize or eliminate as much non-linearity of the input to the power amplifier so proper amplification can occur.

f. **Claim 43**, claim 43 inherits all the limitations of claim 33. Shalom et al discloses "a digital signal processor is used to control the correction signal using feedback from the output for the signal processing apparatus." (Fig. 4, label 118, Col. 9, lines 25-31, Col. 10, lines 1-3)

g. **Claims 44,62**, claim 44 inherits all the limitations of claims 33 and 57, respectively. Shalom further discloses "the linearizer comprises a distortion generator for producing the correction signal from the output signal of whichever of the amplifier and the frequency converter precedes it" (col. 7, lines 27-30, col. 8, lines 1-9, col. 10, lines 8-14).

h. **Claim 45**, claim 45 inherits all the limitations of claim 44. Narahashi et al discloses "the distortion generator comprises a non-linearity generator." (Fig. 4, labels 1,2, Col. 3, lines 26-32 and Col. 6, lines 33-34) It would have been obvious to one skilled in the art to incorporate the claimed limitation as disclosed by Narahashi et al into Shalom et al's invention so to linearize or eliminate as much non-linearity of the input to the power amplifier so proper amplification can occur.

i. **Claim 54**, claim 54 inherits all the limitations of claim 33. Shalom et al disclose "a frequency converter is a downconverter for converting a radio frequency band signal into an intermediate frequency band signal." (Fig. 4, label 128, Col. 8, lines 27-30)

j. **Claim 65**,

i. Shalom et al discloses

- "a signal amplifier and a frequency converter which operate in succession on an input signal" (Fig. 4, label 108 as the amplifier, labels 128,132 as frequency converters)
- "a lineariser which is provided between the amplifier and the frequency converter to introduce a correction signal that is adapted to make the overall input and output characteristic of the apparatus more linear by linearising both the amplifier and frequency converter" (Fig. 3, Fig. 4, label 124, Abstract, Col. 2, 7-14, Col. 7, 27-30,66-67, Col. 8, 1-9,32-35,41-44)
- "the lineariser comprises a distortion generator for producing the correction signal from the output signal of whichever of the amplifier and the frequency converter precedes it" (Col. 7, lines 27-30, Col. 8, lines 1-9, Col. 10, lines 8-14)

ii. Shalom et al fails to disclose "non linearity generator is arranged to generate the non-linearity by mixing its input signal with itself one or more times to produce the non-linearity".

iii. Narahashi et al discloses such a limitation. (Fig. 4, label 124 shows the correction unit receives the input signal, output from label 128, is combined or mixed with the corrected signal output, (Fig. 4, label 1 shows the input signal, label 16, is combined or mixed with itself by label 14 one or more

times since the controller, label 33, adjusts the components in circuits 1 and 2 using a feedback.) It would have been obvious to one skilled in the art at the time of the invention to combine the non-linearity as detected by circuit 1 (Fig. 4) with the input signal one or more times so to detect an error including nonlinear distortion components and noises to allow for effective compensation of such nonlinear distortions prior to input into an amplifier so to cancel error component. (Col. 1, lines 5-13)

k. **Claim 70**,

i. Shalom et al discloses

- "the steps of signal amplification and frequency conversion" (Fig. 4, label 108 as the amplifier, labels 128,132 as frequency converters)
- "the step of introducing" linearization "between the steps of amplification and frequency conversion" (Fig. 3, Fig. 4, label 124)
- "a correction signal that is adapted to make the overall input and output characteristic of the signal processing method more linear by linearising both the amplification and frequency conversion" (Fig. 4, output from label 118, Abstract, Col. 2, 7-14, Col. 7, 27-30,66-67, Col. 8, 1-9,32-35,41-44)
- "the correction signal is produced by a step of distorting the signal produced by whichever of the amplifying and frequency conversion steps precedes it" (Col. 7, lines 27-30, Col. 8, lines 1-9, Col. 10, lines 8-14)

ii. Shalom et al fails to disclose "the step of distortion generation comprises the step of generating and controlling non-linearity components independently".

iii. Narahashi et al discloses such a limitation. (Fig. 4, labels 24,25,26,27 are components of non-linearity and each are controlled separately by the controller label 33) It would be obvious to one skilled in the art to incorporate adjusting the non-linear distortions independently as disclosed by Narahashi et al into Shalom et al's invention so to effectively suppress and eliminate the distortion. (Col. 2, lines 12-45)

l. **Claims 71,72,73,74**, Narahashi et al discloses "the pilot signal is removed from the output of the apparatus by the filter" and "the pilot signal is removed from the output of the apparatus by the introduction of the pilot cancellation signal". (Abstract discloses "the pilot signal is canceled by supplying the error injection path or signal output path with the first pilot signal after adjusting its amplitude", Fig. 4, label 33 shows the adjustment of the error injection path, label 6, Fig. 6, labels 20,37, Col. 5, lines 41-51, Col. 8, lines 18-24) It would have been obvious to one skilled in the art to incorporate the claimed limitation as disclosed by Narahashi et al into Shalom et al's invention so to linearize or eliminate as much non-linearity of the input to the power amplifier so proper amplification can occur.

4. **Claims 46,47,49,55,63,65,66,68** are rejected under 35 U.S.C. 103(a) as being unpatentable over Shalom et al in view of Narahashi et al as applied to independent claims 33 and 57, respectively, in view of Faulkner et al (US Patent No.: 5420536).

   a. **Claim 46,66**, claim 46 inherits all the limitations of claim 45.

      i. Shalom et al in view of Narahashi et al fails to disclose "non linearity generator uses at least one of anti-parallel diodes, a FET channel, dual gate GaAsFETs operating close to pinch-off, Shottky diodes, mixers and multipliers in the non-linearity generating process".

      ii. Faulkner et al discloses such a limitation. (Abstract, Col. 2, line 68, Col. 3, lines 1-2, Col. 4, lines 3-18, Col. 5, lines 64-68) It would have been obvious to one skilled in the art at the time of the invention to modify the inventions of Shalom in combination with Narahashi to incorporate the "non linearity generator uses at least one of anti-parallel diodes, a FET channel, dual gate GaAsFETs operating close to pinch-off, Shottky diodes, mixers and multipliers in the non-linearity generating process" for dynamic variation or modulation of an operating point of the RF amplifier, which is the dynamic bias (Faulkner et al, Col. 4, lines 3-5).

   b. **Claim 47**, claim 47 inherits all the limitations of claim 46. Narahashi et al discloses "non linearity generator is arranged to generate the non-linearity by mixing its input signal with itself one or more times to produce the non-linearity". (Fig. 4, label 1 shows the input signal, label 16, is combined or mixed with itself

by label 14 one or more times since the controller, label 33, adjusts the components in circuits 1 and 2 using a feedback.)

c. **Claims 49,63,68**, claim 49 inherits all the limitations of claims 47 and 62, respectively. Narahashi et al discloses "components of the non-linearity are generated and controlled separately." (Fig. 4, labels 24,25,26,27 are components of non-linearity and each are controlled separately by the controller label 33)

d. **Claim 55**, claim 55 inherits all the limitations of claim 54. Faulkner et al discloses in (Fig. 3) wherein the frequency converter comprises in-phase (17) and quadrature signal (18) paths for handling in-phase and quadrature signals representing a signal at the intermediate frequency band, wherein there is a separate independently controlled, linearizer (19, 20, 21) operating on each of these signal paths to provide excellent reduction in intermodulation distortion and give power added efficiencies.

5. **Claims 36,51-52** are rejected under 35 U.S.C. 103(a) as being unpatentable over Shalom et al in view of Narahashi et al as applied to independent claim 33, in view of Dent (US Patent No.: 5351016).

a. **Claim 36**, claim 36 inherits all the limitations of claim 35.

i. Shalom in combination with Narahashi et al fails to disclose "the pilot signal is one of a CW carrier signal, a full carrier AM signal, a suppressed carrier AM signal, a single sideband signal, a quadrature amplitude modulated

signal, a filter quadrature phase shift keyed signal, a direct sequence spread spectrum signal, and a frequency hopped carrier signal modulated with any of the foregoing kinds of signal"

ii. Dent discloses such a limitation (col. 19, lines 32-68 - col. 20, lines 1-45). It would have been obvious to one skilled in the art to modify Narahashi et al's pilot generator so to continuously and interactively adjust and compensate for mutable modulation inaccuracies and errors. (Col. 5, lines 55-62)

b. **Claim 51**, claim 51 inherits all the limitations of claim 33. Dent discloses in (Fig. 3) wherein the frequency converter (115) comprises a mixer for mixing a mixing signal into a received signal destined to be frequency converted (col. 13, lines 1-7).

c. **Claim 52**, claim 52 inherits all the limitations of claim 33. Dent further discloses wherein the frequency converter is an upconverter for converting an intermediate frequency band signal into a radio frequency band signal (col. 13, lines 1-7).

6. **Claim 53** is rejected under 35 U.S.C. 103(a) as being unpatentable over Shalom et al in view of Narahashi et al as applied to independent claim 33, in view of Dent as applied to claim 52,54, further in view of Faulkner et al (US Patent No.: 5420536).

a. Claim 53 inherits all the limitations of claim 52. Faulkner et al discloses in (Fig. 3) wherein the frequency converter comprises in-phase (17) and quadrature

signal (18) paths for handling in-phase and quadrature signals representing a signal at the intermediate frequency band, wherein there is a separate independently controlled, linearizer (19, 20, 21) operating on each of these signal paths to provide excellent reduction in intermodulation distortion and give power added efficiencies.

7. **Claims 37,56,64** are rejected under 35 U.S.C. 103(a) as being unpatentable over Shalom et al in view of Narahashi et al as applied to independent claims 33,57, in view of McNicol (US Patent No.: 5770971).

   a. **Claim 37**, claim 37 inherits all the limitations of claim 33.

      i. Shalom in combination with Narahashi et al fails to disclose "the pilot is one of a two-tone pilot signal and a multi-tone pilot signal".

      ii. McNicol disclose such a limitation (col. 3, lines 34-38, col. 5, lines 53-57). It would have been obvious to one of ordinary skill in the art to modify Shalom in combination with Narahashi in view of McNicol to incorporate "the pilot is one of a two-tone pilot signal and a multi-tone pilot signal" in order to reduce intermodulation distortion among the multiple channels (McNicol, col. 3, lines 40-41).

   b. **Claim 56,64**, claim 56 inherits all the limitations of claims 33 and 57, respectively.

      i. Shalom in combination with Narahashi et al fails to disclose "the input signal is a CDMA signal".

ii. McNicol discloses such a limitation (col. 8, lines 58-63).

Allowable Subject Matter

8. **Claims 48,50,67,69** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Linda Wong whose telephone number is 571-272-6044. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on (571) 272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Linda Wong
3/22/2007

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